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ROCKS and MINERALS

*A Magazine for Mineralogist,
Geologist and Collector . . .*



. Official Journal of
The Rocks and Minerals Association.

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THE ROCKS AND MINERALS ASSOCIATION

PEEKSKILL, N. Y.

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Organized in 1928 for the increase and dissemination of mineralogic knowledge.

To stimulate public interest in geology and mineralogy and to endeavor to have courses in these subjects introduced in the curricula of the public school systems; to revive a general interest in minerals and mineral collecting; to instruct beginners as to how a collection can be made and cared for; to keep an accurate and permanent record of all mineral localities and minerals found there and to print same for distribution; to encourage the search for new minerals that have not yet been discovered; and to endeavor to secure the practical conservation of mineral localities and unusual rock formations.

Ever since its foundation in 1928, the Rocks and Minerals Association has done much to promote the interest in mineralogy. It has sponsored outings, expeditions, formations of mineralogical clubs and the printing of many articles that have been a distinct contribution to mineralogy.

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Affiliation with the world's largest mineralogical society cannot fail to increase membership, enlarge circles of acquaintanceship, and stimulate a keener interest in mineralogy.

A list of affiliated clubs will be found among the back pages of the magazine.

ROCKS and MINERALS

PUBLISHED
MONTHLY



Edited and Published by
PETER ZODAC

DECEMBER
1938

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ROCKS and MINERALS

PEEKSKILL, N. Y., U. S. A.

The Official Journal of the Rocks and Minerals Association

CHIPS FROM THE QUARRY



PETER ZODAC

Christmas Greetings

"God Bless Everybody," said Tiny Tim in Charles Dickens' **Christmas Carol**. And in this December issue of **Rocks and Minerals** the Editor says this to all subscribers of the magazine and to all who are not subscribers. For it is at this period of the year that the heart of the Editor of **Rocks and Minerals** grows mellow, as he believes the heart of every mineralogist grows mellow towards his fellowmen as Christmas draws near.

Who, pray, can look upon the beauties and marvels of the mineral kingdom without realizing that it was a great and benign Creator who knew form and order and beauty of color who brought them into existence under laws which they too must obey. And, approaching that day of great significance when the son of that Creator came upon the earth, feel the "peace on earth, goodwill to man" which formed the song of the angels upon the night of His birth.

So God Bless you all and give you a Merry Christmas and a Happy New Year full of courage and full of hope.

Christmas Gifts

There is going to be a tremendous amount of nervous energy expended during the next few weeks as to what under-

the sun can be given to a friend or relative as a Christmas present, especially if that friend or relative happens to be a man. If he doesn't smoke, drink, play golf or have any other manly vices—what are you going to give? A book? That might place you in the position of a salesgirl who voicing her doubt as to what to give her boy friend, replied to the well meant suggestion of a fellow salesgirl, "Why not a book?" "No, he's got one." Your trouble could be duplicating one your friend has.

Let us make a suggestion, not for all men but for your particular man, or boy, —or girl for that matter—if interested in mineralogy. A book on mineralogy in which he might be interested or expressed a desire to possess; or some choice mineral specimen he would like to add to his collection. We are sure either would give him a great pleasure. Mineralogical books can be had from \$1.50 to \$15.00. Mineral specimens if attractive, even spectacular, can be had from \$1.00 to \$50.00 or more. On the other hand very good specimens can be had for as low as 50c. If you can ascertain what he would like most, by inquiry among his associates, so much the better, but any dealer in minerals would probably be very glad to advise you. Possibly if looking for books or minerals you could get some excellent hints from the advertising pages of this issue and we are quite certain our advertisers would not only be glad to advise with you in the matter but would feel a real interest in doing so.

We might suggest, too, a subscription to **Rocks and Minerals** which would make the recipient a member of the Rocks and Minerals Association and bring him the magazine every month during the coming year.

PETER ZODAC.

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WHOLE NO. 89

STORM OVER ANTERO

By ARTHUR MONTGOMERY

(All Photographs By The Author)

This is an account of part of the fifth Over-Montgomery collecting season, from late May till late September, 1938. If it reads more like a travelogue, in spots, than a mineralogical article, perhaps I may be excused on the grounds that we had chosen unusually beautiful scenic surroundings for our work. Over and I generally find ourselves in unpleasant places, where the only scenery, if it can be called that, consists of flat, drab desert or barren, rocky hills or canyons. Last season we had the good fortune to spend four months up among some of the grandest, highest mountains in this country, and though our collecting there was extremely successful, on present retrospect I find it far easier to remember the ever-present beauties of landscape than any aspects of the work itself.

* * *

Few mineral localities in the United States are high enough to be inaccessible chiefly because of altitude. Of these few Mt. Antero surely stands pre-eminent. Its 14,200 feet place it not only among the handful of loftiest Colorado peaks but within a mere 200 feet or so of being equal to this country's highest elevation, Mt. Whitney. Located along with the other giants of the College Range, Antero stands very near the exact center of the state, and it would be one of the foremost of a continuous north-south rampart of mountains to meet the eye if you were to look directly westward from the summit of Pike's Peak.

But Mt. Antero is better known as a gem-mineral locality than just as a very high peak. Far more collectors than mountaineers have climbed up its steep, boulder-strewn sides, and those of White Mt. neighboring on the south. For over 70 years men have combed through the endless talus slopes and along the length and breadth of every ridge outcrop, digging, dynamiting everywhere for traces of a blue mineral, searching with that faint gleam in the eye which you will find not so faint in the eyes of the gold prospector. For tales and thoughts of finding gems have led people to do far stranger things than climb a 14,000-ft. mountain, on whose loftiest slopes gems veritably have been found.

Seventy years of mineral collecting at one limited locality—think of it! Of course the collecting has been spasmodic at best, and nine-tenths of the collectors entirely inexperienced and absurdly ineffective. However, a few of them were bound to be good, to be experienced and persistent and lucky; and the earliest of these did not go away empty-handed.

It is certain that some of the finest aquamarines ever found on Antero or White were picked up as surface "float". So that luck could, and did, play a part in the story. It is certain also that some of the early searchers accomplished much thorough and effective rock-moving to shallow depths and secured many fine gem crystals from cavities or "pockets" hidden underneath

the surface. All our stories of the early days on Antero are bound to be uncertain and vague, but one we do know beyond doubt. Old War-maker was one of the first and most successful of all the gem hunters on the mountain, and he left behind him a monument which still endures. This is a small stone cabin, partly now in ruins, but built right up at about 13,500 ft. in the middle of the great south cirque, directly underneath the main summit. How many summers Wanamaker lived in this cabin no one knows, but he must have stayed there many years. On three sides he was ringed around by tremendous cliffs; only towards the east the cirque floor dropped off abruptly to the canyon far below and left an unobstructed and almost limitless view into the far distances where Pike's Peak would rise up on clear days like a mirage, fully 70 miles away. For water he had a small pond in a depression of the cirque (especially after wet winters), which always dried up near summer's end; and for wood he had nothing nearer than timber-line, 1,500 ft. below. Otherwise he lived entirely in a medium of rock, with nothing but millions of boulders for his front yard and millions more for the back. Yet the old man had solved the problem of this mineral locality's inaccessibility, and he must have enjoyed the easiest, and finest, early pickings on Antero. I envy him that, despite the loneliness which must have weighed upon him up there at that altitude, alone with the rocks and the clouds and the stars.

Of recent years we know a little more. The work is getting less and less, as time goes on. What was undoubtedly the most important find of aquamarine for all time happened to be made by my own partner, Edwin Over, back in 1931. It was on White Mt., where most of the aquamarines have been found, and Over told the story of it in early issues of this magazine.* The two of us were not collecting together at that time, but I have often since admired the finest of his pocket's crystals, a full 8 inches

long, in the Harvard University Museum.

* * *

More than a year ago Over and I decided to try a whole season on Antero. We would take a lesson from old Wanamaker and have a camp right up at the final edges of timber-line, at 12,000 ft. We were not too sanguine of success, but at least we would put our heart and soul into a whole summer of prospecting and digging and take one last good shot at the locality before signing it off as another one of those dead and forgotten places.

It was on last May 24th that we drove up over Trout Creek Pass, western portal of the South Park country, and had our first season's glimpse of the College Range to the west. The valley at our feet was already green with spring, but the giants towering above it, Mts. Shavano, Antero and Princeton, formed an awe-inspiring wall of white in the background. Antero, our sole concern, particularly looked snowed-in, with very few spots of dark, exposed rock or trees showing above 10,000 ft. It was a beautiful sight, a superb snow-peak in every respect, but we didn't care for the looks of it and did not suspect that we had a chance of establishing a timber-line camp on the mountain for at least another month.

It was on Over's suggestion that early afternoon found us driving far up Chalk Creek Canyon, bounding Antero on the north, and taking a look at the north and west slopes of the mountain. On the west things seemed a lot better, lower slopes clear of snow right up to timber-line and higher snow slopes cut here and there by long stretches of dark, exposed rock.

This west side of Antero was the untouched side, pretty well unexplored from the mineral standpoint. It was almost wholly covered with heavy slide-rock, with very few cliff or bare-rock exposures anywhere to be seen, but it formed a part of our prospecting schedule nevertheless. We hiked up to timber-line on the spot, finding a good forest trail up East Baldwin Canyon. A high camp was out of the question here

*Over, Edwin, Jr. *The Mt. Antero Aquamarine Locality.* ROCKS AND MINERALS. Dec., 1928, pp. 115-111; *Further Explorations on Mt. Antero.* ROCKS AND MINERALS. Feb., 1935, pp. 27-29.

for the present, but we saw plenty of bare prospecting areas between the snowfields and decided that we could base somewhere below in Chalk Creek Canyon until the snow did some intensive melting. It would mean a climb of several thousand feet up and down each day, but we were soft and welcomed the extra exercise.

We found just the ranch in the canyon, and the following week found us climbing about in a world of snow and ice, surrounded by a stark winter landscape. The main peak of Antero, the high east-west ridge of White Mt., and the sharp matterhorn of Calico Mt. filling the head of East Baldwin Canyon, all were deep under a heavy mantle of snow. It was a time for picture-taking as well as prospecting, and we did not pass up the chance. Over remarked that he had never before seen so much snow in Colorado by the end of May.

The geology of the Antero area is simple enough. The mountain-building, igneous upthrusts consist mainly of a gray quartz monzonite (very near

granite) with smaller enclosed areas of a whiter alkali-granite in which numerous pegmatites occur. The problem is to find the latter, for practically everything is away deep under unending tons of slide-rock. The pegmatites are mostly rich in beryllium, and many show some sort of beryl (usually rough, opaque crystals) to the naked eye. The entire area limited to the alkali-granite and its pegmatites embraces no more than several square miles, the boundaries of which would be roughly delineated by the north peak of Antero, the east peak, by White Mt. on the south, and Calico Mt. a mile or two to the west. The great, massive body of Antero proper must contain a larger quantity and variety of pegmatites than almost any other mountain on earth, when you consider how many of them there are in the few exposed sections and then realize what a minute proportion of the whole these latter represent.

We were not much bothered by altitude, surprising as it may seem. Thirteen thousand feet is high up in the sky



ANTERO FROM THE EAST

Left to right: Mts. Shavano, White, Antero.

in any man's language, and most of our work was carried on well above that level. A little shortness of breath and pounding of the heart at first was all that seemed to trouble us. We soon became thoroughly acclimatized and felt no ill effects at all. By the end of the summer we could climb a full two-thousand feet of rough going in less than an hour, by exerting ourselves.

The west side of Antero showed us a number of pegmatites, but most of these were barren to a degree, small lenses of massive quartz and feldspar with now and then a little coarse beryl on the side. One find only was of importance. High up in some cliffs at about 13,500 ft. we came upon a steep gully with a streak of quartz running down the bottom. The quartz was roughly crystallized in places and several phenakite crystals were embedded in the quartz. We hammered into a little moss-covered ledge and the pick shattered something decidedly softer than quartz. It turned out to be a mass of green and purple fluorite, surrounding the entrance to a pocket. Out of this pocket came a surprising quantity of phenakite, mostly in loose crystals of short, stubby type—that is, mainly rhombohedrons with very little, if anything, of prism evident. Now and then we pulled out a cluster of fluorite octahedrons, or a small, complete octahedron of rough quality. A handful of specimens were clean-cut and beautiful, and the finest of them had little water-clear phenakites sitting on the sides of the fluorites. One specimen showed a superb twinned phenakite inside a cavity in feldspar, of prismatic form as a phenakite twin should be. So far as we knew, fluorite had never been found at Antero in good crystals; here we had plenty of them and in octahedrons, a much rarer form in fluorite than the cube. The combination of phenakite and fluorite was also new, never seen before at any locality. The pocket soon gave out into barren quartz, but we felt more than satisfied with this first find of the season. Fine weather, crisp and cold and invigorating, made us feel better than we ever had before.

The snow was melting fast, and it was nowhere more evident than in the swollen waters of East Baldwin Creek. From a small brook at first, it had grown in a few days to a threatening torrent. We had to cross it coming up through the canyon at about 11,000 ft., and finally one evening we barely got across at all in retracing our steps. The next morning we had to carry up an axe and drop a conveniently-placed pine across the creek some distance below the trail. If we had had any doubts as to putting in a high camp on this west side, they were now redoubled. There was plenty of snow still to melt, and this torrent would be an almost impassable barrier for weeks to come. A week had passed since our arrival, and we decided to take a look at conditions on the east side.

It was by means of the eastern approach that Over had done all his earlier work on Antero. Little Browns Canyon cuts a narrow gash between the southern heights of the Antero massif and the great east-west ridge of White Mt. An old trail runs up this canyon, culminating in a broad, grassy pass at the top, close to 13,000 ft. We found lots of snow still in the canyon higher up, but mostly in scattered drifts which would not interfere with our operations. A small timber-line meadow, fairly clear of snow and sheltered from the west and north by vertical cliffs, seemed the best place for camp. Using four pack horses and the services of a packer from the ranch, we had camp established in two days and felt ship-shape and comfortably settled after a third. We had planned originally to use our own backs for packing, but it would have been a week's job and a tough assignment. Our equipment alone weighed about 500 lbs., with all the drill steel, heavy tools, forge, anvil and blacksmithing equipment; and the basic food supplies for several months, mostly canned things, came to nearly as much. It was a 3,000-ft. climb from the base of the mountain to camp.

A high mountain camp can be wholly ideal if blessed with a sheltered spot and plenty of view. We had both Hem-



Calico Mt. from the north (May 30th)



Calico Mt. from the east (late June)
as seen from the Divide between White and Antero.

med in on three sides by steep cliffs and high mountain walls, we could look out to the east through the scattering of trees and glimpse something of the same view that old Wanamaker had had from the cirque far above us. Right across the canyon to the south, several hundred yards distant, towered the immense, precipitous ridge of White, a solid, impregnable barrier. The grass surrounding our tent was still brown from winter, and several snow drifts in the near vicinity added to this out-of-season touch, but the pleasant noise of a small brook close by and the soft upward sweep of the dark-green pines and spruces beyond reduced the impression of bleakness to one of beauty. And even up in this high, cold world spring could not be far off.

The weather at once deteriorated into black clouds and snow squalls. Nights and early mornings were clear and cold and fine, but by mid-morning we were usually in for it. We kept telling ourselves it would soon be better, but it was just as well that we could not look into the future.

The first week or so, now June, was spent in prospecting and a tour of in-

spection. Over showed me the very spot on the summit ridge of White where he had opened his pocket of huge aquamarines. I was impressed not only by the height, 14,000 ft., but also by the thought that he had done a steady six-weeks' job here under almost impossible circumstances. He had lived in a cabin at the foot of the mountain and had had to climb up 5,000 ft. every morning and down 5,000 ft. every evening just as a preliminary and after-thought to his work! That is real mineral collecting.

I was further impressed by the immensity of Antero itself, its tremendous high-flung ridges to the north, east, and south and the great expanses of steep boulder-covered slopes in between. On the summit of the main peak there was a small cairn, enclosing a book which listed the names of all climbers. I could have filled this book with my own name if I had wanted to, for by the end of the summer I had climbed within a few yards of the summit 40 or 50 times. Most of my work was done high up on Antero while Over confined himself to the area he knew best, White.



Our camp at timber-line, 12,000 ft.

In the course of our early prospecting we found some pegmatites up near 13,000 ft. along the south-east Antero face. We each discovered a pocket. Mine was four times as big as Over's, but all the good specimens emerged from his. This area had been extensively worked, as we could see by a number of empty pocket-cavities here and there. And neither of our pockets came easily, for we got them by banging into every square inch of pegmatite exposure. Both opened suddenly out of solid rock, but there the similarity ended. Out of Over's came a string of marvelous phenakites and fluorites, with the emphasis on the former. One specimen showed several phenakite twins of great size and beautiful quality, far ahead of anything either of us had ever seen from Antero. Some loose twins of smaller size had absolutely perfect transparency and a pale yellow color. If phenakite ever looked a gem mineral, here it was. No such twins have ever been seen from any locality in the world, as far as I know.

As I have said, my own larger pocket was a disappointment. Yet it was an amazing pocket. When my pick suddenly broke through the solid wall of feldspar, I could look through the jagged opening into a cavity of such size that I thought at first I must have somehow penetrated all the way over to a big natural crack or gully in the cliff. Then as I enlarged the opening, light filtered into the hole and showed a circular cavity four feet in diameter and several feet high, completely enclosed by rock. And the walls were of very nice pegmatite pattern, coarsely crystallized feldspar and quartz. I reached in and pulled out of the bottom a loose mass of smoky quartz nearly a foot long. Before I had done with that pocket I had taken out nearly a hundred smoky quartz crystals of all sizes and quality, mostly rough and opaque unfortunately. Everything was loose in the bottom and obviously had dropped off the top and sides. Emptied of its contents the cavity was a full six feet deep and large enough to hold several people without crowding.

I never saw a sign of phenakite, and only one good octahedron of fluorite showed up, much to my disgust. Several handfuls of very pale, etched, inch-long aquamarine crystals came out of a soft white clay near the bottom, and I cursed their presence vehemently. For aquamarines and phenakite hardly ever go together in the same pocket, possibly indicating that some Antero phenakites have formed as a result of the disintegration of earlier beryl. Over's pocket did not have a trace of beryl in it. My smokies were the only consolation, and the largest groups of crystals were not at all hard to look at. Several of the latter measured a foot or two in diameter. There was some crystallized albite and large rough microclines; a few quartz crystals had little aquamarines sticking right out of them. Altogether a very poor production when you think of the size of the pocket.

Late in June we were joined by George Switzer, of Harvard's mineralogical



Cliffs on Antero's south-east face from snow field near the Divide.

cal department, who wished to ask the pegmatites some purely scientific questions. The results of his researches will be published before long, which relieves me further from talking about matters extremely technical, or, rather, trying to talk about them. Switzer brought warmer weather with him, but we soon discovered that the warmer the weather, the worse the storms. Thunder and lightning moved in upon us in no uncertain terms, and they stayed with us till the bitter end. More of these disturbances later.

The Over-Montgomery technique began to get real results about this time, especially the first half of the combination. In a period of three weeks Over opened three fine aquamarine pockets on White. It was a noteworthy piece of prospecting, for the area in which they were found has been by far the richest gem producer in the whole region and has been gone over as with a fine-tooth comb by nearly every aquamarine hunter who ever visited Antero with purposeful countenance.

Pocket No. 1 opened out of a small seam of pegmatite in a vertical cliff-face. A small pocket, it ran almost entirely to aquamarine, yielding more than two hundred crystals altogether. Over fairly raked out the crystals when he got into the richest part. Most of them were small and of not too deep a color, but they were beautiful long prisms at their best. One specimen was wholly unique. Have you ever seen a cluster of six or seven aquamarines, with individual terminations but merging together near the base into a lovely mass of richest blue color? It was an exquisite fan-shaped delicacy from another world.

The second pocket even surpassed the first. Over got it in the side of a crevice away back under a huge, overhanging mass of rock. Before he was through he had dynamited off the whole affair, but to begin with he could not risk the slightest movement. Many crystals were loose in the crack, and they would have been crushed to dust between the rocks. The best crystals

had perhaps the finest depth of blue color ever seen in any Antero aquamarine, and they showed beautiful modified terminations besides. Nearly all Antero aquamarines are terminated solely by the base; here was a most remarkable exception to the rule. The crystals lacked size alone, not longer than 3 or 4 inches in the biggest, but their superb quality well made up for this. Just as unique as the radiating aggregate from the other pocket were several matrix specimens, and "matrix" should be underlined. I have never seen a really good aquamarine matrix in any museum. Here were several bases of mica crystals and etched feldspars and smoky quartz, and projecting out of them, or lying flat upon them, a scattering of delicate, transparent prisms.

The third and last pocket was of interest chiefly to Switzer, for its aquamarines exhibited pronounced etching at the terminations. Signs of fluorite in the pocket indicated that the etching agent might have been hydrofluoric acid, but why was it that just the ends of the crystals were attacked? Could the main body of each prism have been embedded in some protective matrix? And right here is a paragenetic problem that has puzzled and fascinated me ever since I opened my first pocket. These aquamarine crystals which are lying loose in the bottom of the pocket, exactly like the tourmalines we mined at Mesa Grande, Calif., how were they formed and to what were they attached on growth? Undoubtedly to something which entirely disintegrated over the ages and disappeared in miraculous fashion. In my big smoky quartz pocket you will recall that the little beryls were embedded in a clay, probably an alteration-product of some other mineral like feldspar. There we have, at least, a hint as to how it happened, but in most of the loose-crystal pockets I have seen there is not a sign of any original attachment matrix.

I had not been idle during this period and had turned up some good things throughout the Antero vicinity. I spent most of the summer concentrating on

this one area, and if I did not cover every square foot of slope and ridge at least I made an earnest effort in that direction. The slide-rock on those slopes was enough to turn one's hair gray. Several times I found good float in the slides, usually phenakite, and traced up the slope towards the source until I stood face-to-face with an agglomeration of boulders the size of houses. That was the tragic end of it for me. But three times I had the luck to trace my float to a source where the slide-rock was not so thick. Five or six feet of boulders, all nicely fastened together with ice, would fall into this category. One pocket produced some beautiful little fluorites and phenakites, and a few of the former were twinned in an amazing manner. They were flat plates, the result of two octahedrons revolving about one another in a thoroughly unrestrained fashion, and in several of them the two individual crystals could be clearly seen, one in reverse position to the other. One very flat fellow was quite transparent and showed the interior of the crystal divided

up into three or four distinct zones of different colors, purple to colorless. It seemed to be a repeated twin. Similar twins are known in the diamond, but octahedral fluorite twins never before have been described. Another find of mine showed a weathered area of pegmatite with a good many loose pieces of massive aquamarine of fine color. In a few cavities of some specimens were little white bladed crystals. This was the rare mineral, bertrandite, with practically the identical composition of phenakite and commonly supposed to have formed as the result of beryl alteration. Several bertrandites were quite large and fine; all of them appeared to be simple crystals. From a later pocket on top of an Antero ridge we found some bertrandites mostly in tiny heart-shaped twins. My third find was nothing but a small vein of pegmatite, chiefly massive, fine-grained feldspar with beautiful, often gemmy, aquamarine crystals "frozen" into it. It makes interesting polishing material.

We did not do all this work under cloudless skies, I am sorry to say, which



Looking out to the east from camp. North-east face of White in right background.

were the conditions Over said we should have had most of the season. Instead we encountered the nastiest, wettest Colorado summer on record. I could write reams on matters pertaining to weather alone, but I shall try to restrain myself. I can give you an idea of the sort of storms we had by describing a typical July day on the mountain, just one that I remember along with a great many others.

It was a cloudless morning when I left camp. Birds were singing in the trees as I passed the final, scattered edges of timber-line, and I noticed a number of charming, delicate alpine flowers among the rocks along the way. By the time I had reached the big snow-field I looked back and saw the usual, wispy, grayish clouds materializing out of nowhere and standing motionless over the eastern ridges of Antero and White. By the time I had neared the top of the pass, at 13,000 ft., the same clouds had retained their positions but were growing unbelievably into darkly-threatening masses of balloon-like vapor. It was 9 o'clock, just a half-hour from camp.

In another half-hour I had climbed up over the summit of Antero's great south ridge, a thousand feet above the pass. A tremendous array of black clouds was coming up out of the west, over the top of Calico and the mountains beyond, moving at a swift pace right in my direction. Oddly enough, the hitherto stationary cloud masses in the east were now billowing out towards me also. They were converging upon Antero from several directions. I knew there was very little time, and I seized a pick and set to work at a hole I was digging. For about ten minutes all went well.

Suddenly I began to hear a faint humming in the air, something like a giant dynamo in the distance. I threw down the tools, grabbed my pack, and made for the edge of the ridge; I knew the signs. Without warning my hair began to sizzle and buzz inside my hat like a swarm of bees. The small prospector's pick in my hand was now whining like a live thing and I chucked it from me as I went over the edge at top speed. As soon as I was off the top the hum-

ming stopped and my hair felt like normal hair again. However, the fun was just beginning. I climbed down through the boulders, a hundred feet down the slope, looking for a decent shelter.

The sky was now like pitch overhead, almost a blue-black; streamers of mist, dead-white against the dark background, swarmed around and past the sharp point of the east ridge and cut it off from view. A vivid flame of lightning etched itself against the clouds and the terrific explosion of thunder was practically simultaneous. I crawled under an overhanging boulder as the fireworks began in earnest. The lightning began to play along the tops of the ridges with a furious intensity, and the roars of the big guns began to sound so close that I shivered in my boots. After a while I looked out just in time to see a titanic arc of yellow flame leap out between the top of my ridge and the next one, several hundred yards away. After another second a perfectly terrific explosion sounded almost on top of me and a boulder jumped loose on the steep slope above, far off to the right, and hurtled down the mountainside taking a small avalanche of rocks with it. Things were getting too close for comfort, and I wedged myself still tighter under my boulder.

A cascade of hail was the next feature on the program. The noise of the hailstones, as large as moth balls, sounded with a swishing and rapid-fire drumming on the rocks. In a minute or two everything was white; several inches of it before the hail stopped. It hailed intermittently for nearly an hour altogether. By this time I was soaked to the skin. Gradually the clouds began to lighten and break apart; the storm was over. I stood up and tried to thaw out a little. When the sun finally came out it was nearly noon. In climbing to the top of the ridge again my feet became wet, up till then the only dry part of me. I ate my lunch in solid discomfort and cursed the weather. All the higher surrounding peaks were covered with snow, very lovely in the sunlight, but I failed to get any enjoyment out of the

view. Finally I had cleared the slush out of my hole and was really getting down to work.

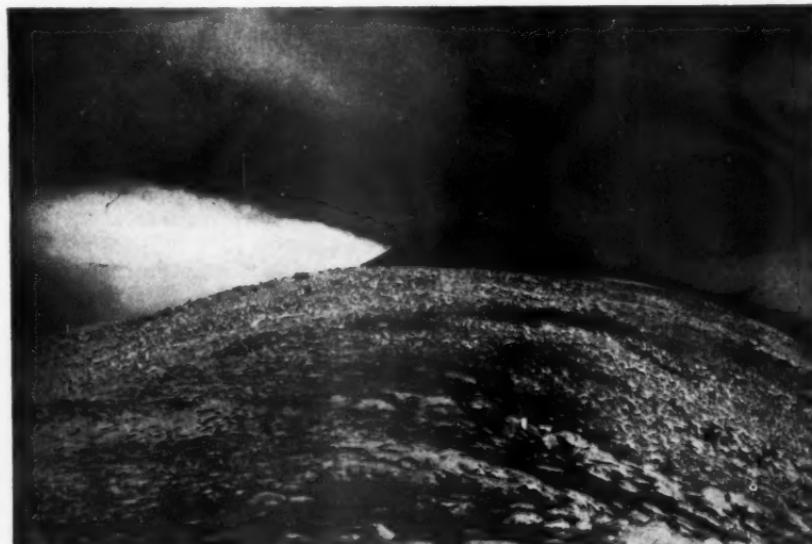
By two o'clock the clouds came together again and another big storm set in. I crawled under the same boulder and succeeded in getting just as wet as before. After it was over, I gave up completely and trudged down the mountain towards camp, cold and wet, weary and disgusted with minerals, mountains and all the elements. Such was the weather we had on Antero.

Switzer left us in late July and we were sorry to see him go. Camp had been a very companionable place with him there, and conversation never lagged when we sat around the camp-fire of evenings and watched the flames flickering against the night. When Over and I are alone together, we get talked-out completely sometimes and sit by the fire in silence. Often we were too tired to talk, for seven or eight hours of hard physical labor at 14,000 ft. would leave us in a sort of drugged condition when we relaxed in camp. Too much physical

effort seems to empty a man's mind completely, of every thought and every ability for thought.

During August and early September Over and I made some additional finds, mainly in phenakite, fluorite and smoky quartz. One smoky-quartz pocket yielded a half-dozen loose fluorite octahedrons, sharp as if cut by a lapidary and partly transparent throughout each pale-purple interior. Another pocket produced some quite excellent Baveno twins of microcline; still another, a handful of etched, yellowish topaz crystals. The smoky quartzes from many pockets were as fine for color and form and quality as anything ever seen in this mineral from the Rockies.

In late August and through early September our daily electrical storms abated somewhat, to be replaced by long, continuous rains. We did not even try to get up the mountain in that sort of weather and we minded it far more than the most violent storms. We were tackling a difficult piece of work at this time. Towards Calico Mt. there was an



"STORM OVER ANTERO"

As encountered on south summit-ridge, main peak in background.

old abandoned molybdenite mine, with several tunnels and small shafts run in along the ore-carrying veins. These were pegmatites also, consisting chiefly of quartz with considerable beryl and scattered concentrations of molybdenite. The place had been thoroughly worked out. Some of the quartz had pocketed, we found, and one limited streak in the dump had in it a few very beautiful beryl crystals of absolutely water-clear, colorless quality. Unfortunately, this particular dump material had been used to fill up an old shaft, and by the time we had worked through all of it we were down about ten feet in a very narrow cut, with vertical, over-hanging walls towering overhead for another twenty feet on three sides. It was one of the most dangerous places I ever saw, especially after the rains got started. After one severe rainy spell we discovered a huge crack opening up around the top of one wall, two or three feet back from the edge. There was still some rich material in the bottom of our cut, but we did not dare take it out. We left the mine alone for a few days, a wise precaution. When we returned, sure enough, the whole top had caved in. There was nothing for it but to roll up our sleeves and start at the very beginning again. Finally we had reached the bottom of the cut and had sorted through all the material, but not before Over narrowly escaped annihilation. While he was in the hole, several tons of rock suddenly slid down on top of him. I was kneeling just by the edge of the cut at the time. We both simultaneously heard that slithering noise, the sound that miners dread more than any other thing. Over looked up, and I yelled bloody murder. He tried to leap up the side towards me, but his foot caught in the rope. That would have been Over's finish, if matters had gone according to Hoyle. But some timbers which we had wedged across the top of the cut in a very unsupported condition miraculously held the downward rush of the rock for a pair of seconds. Then they broke under the weight. But in those seconds Over had half clambered

up the wall; I had reached down, seized his arm and helped pull him out. Why we did any more work in the cut after that, I don't know, except that we have learned to be persistent. We completed the job to our satisfaction and thankfully said good-bye to the place. A final look at the mine before we left Antero for good revealed that practically everything above the cut had caved into it. The cut had ceased to exist.

Snow began to come in on us after the middle of September, and we saw the writing on the wall. We stuck it out until the end of the month but accomplished very little of anything. As we had made no new finds during the last weeks of prospecting, it did not matter much. But I shan't forget those last few days high up on Antero. The ground was frozen and several inches of snow lay on the north slopes. A cold wind howled in out of the north, sometimes with such intensity that a man could not stand upright against it. The temperature dropped away down, and it was a constant fight to keep the hands and feet from freezing. It was a fitting end to what must have been the wettest and worst high-mountain season in Colorado records.

There were other finds of ours and other experiences; they must go untold. But I cannot escape fleeting remembrances:—like those constant rock avalanches on the steep slopes of White with their undertones of distant thunder, especially sinister when heard in the silence of the night; like our frequent and fascinating encounters with Antero wild-life, the mountain sheep always seen at great distance, the three combative badgers met by Over at 13,000 ft., the whistling conies, the stealthy marmots and martins, the porcupines grunting around camp after dark, chipmunks all the way to 14,000 ft., and last, but not least, the pocket gopher who dug his maze of tunnels right under our fire-place and was liable to pop up almost anywhere of an evening.

I cannot forget these any more than I can those fragile alpine blossoms growing among the barren rocks, that

marvelous intense blue of the sky seen after storms and on clear days, mist filling the canyon like a white sea, moonlight streaming down the cliffs and a fiery red sunset flaming over the pass. All this can never be forgotten. Life is worth living for such moments alone, for it is in such a high mountain world as

Antero's, calm and quiet and timeless and utterly separate from outside things, that one can put in each proper place bad weather, bad luck, hard work, even mineral collecting. If we had not collected a single mineral, still it all would have been very much worth-while.

APPENDIX

Mineralogy Of The Antero Pegmatites

BERYL ($\text{Be}_3\text{Al}_2(\text{SiO}_3)_6$)—Beryl is the most important mineral of the area, and Antero itself is the premier aquamarine locality in North America. Many Antero pegmatites show some signs of beryl, though usually of the opaque "frozen-in" variety. Gem aquamarine is confined almost entirely to pockets, where it is one of the earliest minerals formed.

. Antero beryl is nearly always a fairly bright blue in the commoner opaque types; a pale blue-green to a delicate blue in the gem aquamarine. The one exception is the transparent, colorless crystals of Calico Mt. In size the larger aquamarines average 2 or 3 inches in lengths, though two of our pocket crystals (broken by frost action) measured nearly 5 inches and the biggest crystals of Over's original pocket reached a record length of 7 to 8 inches. The pocket crystals are typically terminated by the base alone, but one of our pockets ran to well-modified terminations. Rarely the second-order prism is found in addition to the usual first-order; most prisms are long and slender. Etching is common at the terminations alone, where etch figures may be in evidence, but we found a few prisms also corroded.

Phenakite (Be_2SiO_4)—Next to beryl comes phenakite in importance to the collector. Antero is by far the outstanding locality for this mineral in the

country, and probably second only to the Brazilian crystals throughout the world. It is very common in the Antero pegmatites, usually associated with fluorite, hardly ever with aquamarine. It has formed in the pockets over quite a period and several generations of crystals of different habits may be found.

The largest crystals come to nearly 2 inches in diameter. The habit is very varied, most crystals short and stubby with very little prism, but some pockets producing simple long-prismatic crystals. Penetration twins of long-prismatic habit are exceedingly rare, as in all phenakite occurrences, but two of our pockets ran so strongly to them as to have nearly as many twins as simple crystals. Many twins showed a very distinct pale-yellow color in contrast to the white of all simple crystals, and were exceptionally transparent and water-clear also.

FLUORITE (CaF_3)—Very little fluorite had ever come from Antero, or been described from there, but we found it to be one of the commonest pocket minerals of the pegmatites. Often associated with phenakite, it is like that mineral in being seldom found with beryl. In the pockets it seems to have formed more or less contemporaneously with phenakite, usually a trifle later. Partly destroyed and etched fragments of

fluorite were found in some pockets, and such disintegration may have helped supply hydrofluoric acid as an etching agent.

We found this mineral entirely in octahedrons, never in the common cubic form. Several crystals showed the decahedron in combination with the octahedron. Flattened octahedral twins were found in one pocket, this being the first recorded occurrence of such a twin for fluorite. The color is typically purple, though it may range between amethyst and pale green also. Some octahedrons were found up to a size of 5 and 6 inches, and several groups up to

BERTRANDITE ($H_2BeSi_2O_6$)—This rare mineral has been found in several pegmatite pockets in the area, and the best Antero crystals are the finest known. It is always associated with beryl and is supposed to have formed from the alteration of the former mineral. Antero crystals are usually flat plates of small size, but frequent twins have a heart-shaped form. Our largest crystals attained a length of nearly an inch.

ILMENORUTILE—This rare variety of titanium dioxide was encountered in one pegmatite in flat, black twinned crystals of small size. It is present also in other pegmatites in massive form.

TOPAZ, APATITE, and a brownish mineral as yet unidentified and likely to be **Gadolinite** according to Switzers preliminary guess, all are of very rare occurrence. We found topaz in two pegmatites, as highly-etched, yellowish crystal fragments in one pocket and as rough, opaque, frozen-in crystals of some size in the other pegmatite. Along with the opaque topaz were found some small masses of a black metallic mineral which may be **Columbite**. Apatite was found as just a single crystal in one pegmatite

cavity, colorless, transparent and of prismatic habit.

QUARTZ—Quartz, which along with feldspar forms the main body of the pegmatites, occurs in most of the pockets as crystals of the smoky variety. Some very large crystals were found by us, up to a foot in length, as well as many fair-sized groups of crystals on microcline.

FELDSPAR—Crystallized feldspar occurs in the Antero pockets chiefly as microcline, but small, later crystals of albite may be abundant also, and crystals of adularia were noted as of rare occurrence in several pockets. Much of the microcline has been badly etched, but a number of sharp, white, porcelain-like crystals were found in a few pockets, in good Carlsbad and Baveno twins as well the simple form.

MUSCOVITE—Muscovite is a common constituent of the Antero pegmatites and well-formed crystals were found in most pockets.

LIMONITE—Iron oxide is very common in the pegmatites, and most pockets show fair cubes of brown limonite pseudomorphic after pyrite.

MOLYBDENITE and **MOLYBDITE** are found only in the Calico Mt. quartz veins, the molybdenite as small flakes and rosettes of rounded flakes and the molybdite as the earthy, bright-yellow alteration product of the other.

SULPHUR was found in one pocket associated with masses of limonitic pyrite from which it must have been derived. The occurrence was in scattered yellow grains and tiny indistinct crystals; it is most unusual to find this mineral in a pegmatite.



Over stands against the sun on the main summit. Looking south towards White and Shavano (late September).

THUNDER EGGS

By J. W. PATTON

During November, 1935, I heard that there was some Septaria to be found in the Black Mountains about 25 miles north of Barstow, California. My informant did not know it as Septaria. He called it "Thunder Egg", which I found out later is the Indian name for it. The legend, locally, is that the Indians believed the lumps of clay were eggs which had been broken by thunder, and the chalcedony which fills the cracks was the contents of the egg which flowed out.

Thunder eggs from different sections appear to have been produced by different methods. Some appear to have filled amygdaloidal holes in rock, others are round and have a botryoidal surface.

The ones we found here were entirely different. They were evidently the result of clay being spread out over a level surface; after the water evaporated, the clay contracted and broke into blocks more or less square. Water running over the blocks rounded off the corners. The blocks upon drying cracked again and these cracks were filled with chalcedony by deposition or by osmosis. The clay itself contains silica and takes a polish. Another local name for these thunder eggs is "quartz filled clay nodules."

The clay is white, yellow, brown and red. The chalcedony is mostly clear with some browns and yellows; many patches of white opal may also be present. When the nodules are cut in two and polished they make very nice cabinet specimens. Many people break them open looking for fire opal. I have never seen one with fire opal. For cabinet specimens there is no need to break them as there are no blanks.

Thunder eggs very seldom show fortification lines as in agates. They do however show successive layers of chalcedony and opal similar to onyx. They have apparently been moved from their original location as they are now lying on sloping hill sides and I found them to be the same to a depth of three feet,

which was all the digging I cared for as it was a hot day on the desert.

I went to call one evening, upon a Mr. Swisher who collects thunder eggs from different places. He has large cabinets full of all kinds of minerals but especially thunder eggs. He has them from one inch to eighteen inches in diameter and all polished. He had been to the place I wished to visit and as he is always ready to go to any place that looks rocky, it was soon arranged for Mr. Swisher, a Mr. Hake and me to go there.

This location is about 165 miles from Los Angeles. Of this, 15 miles is a couple of ruts through the sand, the balance is paved. We left home at eight o'clock one Saturday evening and traveled north over Foothill Boulevard through San Bernardino and Victorville to Barstow.

South of Victorville we passed through the forest of Joshua trees which are very large in this neighborhood. At Barstow we turned west on the road leading to Hinkley.

Just before reaching Hinkley we left the paved road and turned north over a trail through the sand. From here on there was nothing but sand and cactus. We followed this trail about 8 miles to a large dry watercourse running east and west. We turned east in the bed of the water course and after about 4 miles of tough driving we turned north out of the water course on a little better trail, by that I mean there were more rocks and less sand. We followed this trail 3 miles to the base of Opal Mountain.

We reached there about two o'clock and went into camp to wait for daylight. Opal Mountain is a high peak which can be seen from all around here. It is cone shaped and rises directly from the floor of the desert. On the slopes and around the base there is plenty of very nice common opal - white - gray - brown - tan and other shades which make nice cabochons. I have been told

that there is a mine shaft some where on the mountain from which fine cherry opal was taken about twenty years ago. However I could not locate it.

When daylight came we built a fire and fried some bacon and eggs. That is the standard meal on the desert and with coffee boiled on a smoky wood fire it puts you in shape for a good day's work. We took our bags and started after "thunder eggs", and we didn't have to go more than three hundred yards from the car. The slopes were covered with them of all sizes.

There are fragments every where that people have broken but there are also lots of good ones. In some, the chalcedony only fills seams, but in others the entire interior is filled and there are no two alike. We collected what we wanted of them, and then separated and went in different directions to see what else we could find.

I secured some nice agates, jasper and common opal, also some rocks with a coating of clear hyalite. It was very warm on the desert that day and we started back about noon. I had put the trunk on the back of the car so we loaded our eggs in that. I guess we had a hundred pounds. Well that trunk was made to carry a suit case, not a load of rocks. When we reached the highway at Hinkley we drew up under a tree to eat lunch. While we were eating I happened to look at the trunk and saw that it was leaning back at an angle of forty-five degrees and was held by one small bolt.

After lunch we continued east toward Barstow and about two miles west of Barstow we stopped at a quarry from which road material had been taken. It is a very hard white limestone with splendid separation joints in which are beautiful dendrites on all surfaces. The dendrites are black pyrolusite. We secured some specimens weighing from one to five pounds each.

At Barstow we went to call on a collector named Williams. At one time he had a wonderful collection of large specimens, but he is not so active at present. Among other things he showed us a four

foot mud saw with a hoist to lift large stones. He had several three foot lap wheels. He gave us each about ten pounds of kaolin to use on mud saws. He says there is a large deposit of it near there.

As evening approached the temperature dropped a little so we took the road for home and had a pleasant ride through the orange groves.

Mr. Swisher has some thunder eggs from the Chocolate Mountains in Imperial County that are nicer I believe, than the ones I have described. The clay in them is red. I expect to go there this summer and will know more about them then.

Mr. Hake has a great fondness for moss agate and he and I have collected them in Oregon. He has a very large collection of polished specimens. If any of our readers have specimens of the Oregon or Illinois thunder eggs, or any from other places, I suggest they write Mr. Zodac, our editor, a description and location so that we can determine the points of similarity.

I am sure all the Rock Hounds would like these eggs, even though they cannot eat them. They are cut and polished for all purposes such as cabinet specimens, book ends, paper weights, buttons, ring sets, and in fact anything that agate is used for.

Recently Mr. Swisher informed me that he had been back to the Thunder Egg location and had found some agate which he called "Black Agate". Well I have read about some black agate being found in Europe and was curious to know whether this find was really agate, or smoky quartz.

We traveled out there one Saturday and found, just to the right of the Thunder Egg Hill, an area of about a half acre on a gentle slope containing the black agates. In my opinion they are true agates, although they do not show many fortification lines. Some of them show more brown than black, but I found several that are totally black. All of them show some black, usually on the outside. I cut one into a ring

set and it shows a very good picture of a woman's head and bust on a pedestal. This is by far the best stone I have ever cut. It does not require any imagination to see the picture in it.

Many of these agates show parallel lines, as in onyx, and some show other agate features.

We collected all the loose agates we could find. We could not determine the source, but on digging down unto the rock we found a hard matrix con-

taining streaks and patches of the black material. We like these agates very much and would like to know if any similar material has been found in the United States.

I think I will send some of these agates to Mr. Zodac and let him give us his opinion of them. Unless we can find the source of the agates, I am afraid we will have to be satisfied with the few we have found as they are very scarce at that location.

CLUB AND SOCIETY NOTES

PLAINFIELD MINERALOGICAL SOCIETY

Plainfield Mineralogical Society Affiliates With the Rocks and Minerals Association

At the October meeting of the Plainfield Mineralogical Society, of Plainfield, N. J., the members voted unanimously to affiliate with the Rocks and Minerals Association. The Society now has a membership of 38 active members and 8 corresponding members.

A Certificate of Membership suitable for framing has been sent to the Plainfield Mineralogical Society.

Members of the Rocks and Minerals Association residing in or near Plainfield, N. J., who are not members of the Society, are urged to communicate with the Secretary, Mr. Joseph D'Agostino, 711 Sheridan Ave., Plainfield, for the purpose of joining this new organization.

The Chiselers Club

The Editor of this magazine by special invitation was a guest at the meeting of "The Chiselers" of Crestwood, N. Y., on Sat. Nov. 5th. "The Chiselers" is the name selected for their club by thirteen earnest mineralogical students—young ladies of 10 years of age. There was a full attendance and business was transacted in most orderly and parliamentary form. At the conclusion of the business session a social hour was enjoyed of games that were given a mineralogical trend. Some of the games were unique and very exciting. This was followed by the serving of refreshments.

The Editor was elected an honorary member, but as the club numbered 13,

not counting the sponsor, Miss Evelyn Waite, and though he is not superstitious, he thought the club should be made 14 by allowing him to become an active member, even if he was a man.

The President of the club is Miss Eleanor Rao and the Secretary, Miss Edith Larson.

Rocks and Minerals hopes to print someday a mineralogical article written by one of the young ladies.

At the October business meeting, "The Chiselers" voted unanimously to make **Rocks and Minerals** their official journal and to affiliate with the Rocks and Minerals Association.

WITH OUR MEMBERS

R. Emmet Doherty, President of the Rocks and Minerals Association, who has been touring the West Indies and northern South America, is due to return home about the time this issue makes its appearance.

Wilbur J. Elwell and T. Lipton Hart Smith, both of Danbury, Conn., have made recently a number of trips to New York localities. At an old limestone quarry in New Baltimore, Mr. Smith found a pocket just loaded with fine calcite crystals.

Bradley Johnson of Penland, N. C., has been on the sick list for many weeks. No sooner does he get on his feet than he plans to do some collecting for a few friends. Such is a mineral collector!

Miss Dorothy Jackson of Elyria, Ohio, was the first member to answer the Editor's appeal which appeared in last month's issue. She has sent in a road map of her state with localities known personally to her marked thereon plus some interesting comments on these localities.

Miss Elizabeth King of Halifax, N. S., Canada, found some interesting specimens recently of molybdenite in a tourmaline matrix. The specimens were collected at a small abandoned mine in New Russell, N. S.

D. D. Stevens and the Misses Helen Wright and Gertrude Schmidt, all of Castle Point, N. Y., are very secretive about some fine quartz crystals which they collected at an old abandoned lead mine in the wilds of Dutchess County, N. Y. No amount of persuasion, pleas, bribery or even threats can induce them to reveal the mine's location. What shall we do about it?

R. George Rasmussen of New Albany, Ind., is keeping close tabs on road cuts

and other excavations of his vicinity. Some very interesting calcites, selenites and other minerals have thus been found by him.

Cuba is well supplied with interesting minerals if we are to judge by the specimens recently received from Jorge Morlon of Habana. Señor Morlon is an active collector and has found many specimens at localities that are new to us.

John N. Trainer of New York City and Brewster, N. Y., almost caused a riot during a recent visit to the Tilly Foster iron mine, near Brewster, by the Plainfield Mineralogical Society. He showed the boys a large block of rock on the dump that contained serpentine pseudo. after periclase, and that started things going. With a rush the gang swarmed around that boulder and for a few minutes everything was in confusion with hammers pounding, dust flying and fingers grabbing; it was a wonder no one got hurt. But the specimens collected were excellent examples of this rare form of serpentine.

Henry Thurston of Montrose, N. Y., not long ago had a new garage built alongside his house. But something went wrong with the plans as the car does not fit the garage any more; in fact the space seems to be shrinking regularly. The car can now go only half way in. Mrs. Thurston is completely mystified but Jane, their young daughter, says: "It's Daddy's rocks on the floor. Every week he adds more to them so that the car is being crowded out."

Mr. and Mrs. Stanley Conyes, of Ossining, N. Y., recently invited the Secretary to visit them. But the invitation may never be repeated simply because the Secretary could not curb his appetite. It was all due to a cake which Virginia, their attractive daughter, had baked for the occasion. It was so delicious that the Secretary ate eight pieces.

If You Are Planning To Move—

Send us your new address promptly, giving your old address at the same time, so that new issues may reach you without delay. Every month many copies of the magazine are returned because members have moved without notifying us of their new address and without leaving a forwarding address at their old post offices.

MAKE THIS A MINERALOGICAL CHRISTMAS!

Give minerals, mineralogical books, gems, fluorescent lamps, lapidary supplies or subscriptions to **ROCKS and MINERALS** as Christmas Gifts. The advertising pages of this issue offer many attractive items.

Articles Are "Tops"!

Hartford, Conn.—With each issue of **ROCKS and MINERALS**, it keeps getting better and better. I like it so much I can't do without it. I get a great deal of pleasure in reading it and lots of valuable information. Everyone of the articles are "tops". May **ROCKS and MINERALS** live forever.—Janet Bradley.

New Occurrence for Dumortierite

Small fibrous aggregates of purple dumortierite in gray pegmatite were collected on the dump of Aqueduct Shaft No. 18, Valhalla, N. Y., Mon., August 22, 1938, by Peter Zodac, Editor of **ROCKS and MINERALS**. Clifford Frondel of Massachusetts Institute of Technology, Cambridge, Mass., who examined the original find, visited the locality the next day and found larger and even better specimens.

Blue Quartz at Shaft No. 8

Fine specimens of blue quartz, occurring as veins in gneiss, are common on the dump of Aqueduct Shaft No. 8, east of Fahnestock Park, near the Seven Mile Road, Putnam County, N. Y. When wet, the specimens are very good but on drying the blue color fades somewhat.

This and other shafts of the area are

being sunk for a new source of water supply by the Water Department of New York City.

A Reminder

With this issue of **ROCKS and MINERALS** a large number of subscriptions, almost 1,000, expire. Will those members whose subscriptions thus expire send in their renewals promptly so that there will be no delay in the mailing of their January numbers?

HACKMANITE

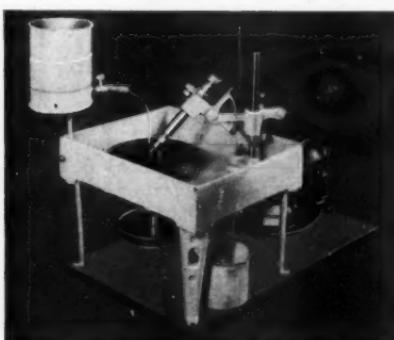
A curious mineral from near Bancroft, Ont., Canada, that exhibits reversible photosensitivity under the argon bulb, cold quartz lamp, iron spark, etc. When extracted from its matrix at the locality it has a reddish-violet color but on exposure to strong sunlight this color fades rapidly to white. On exposure to ultraviolet radiations the reddish-violet color is quickly restored (the mineral must be exposed at least 8 minutes under an argon bulb.) These reactions may be repeated indefinitely.

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